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ABSTRACT

This booklet lists tasks and functions the student in the transportation cluster should be able to do upon entering an employment situation or a postsecondary school. (Listings are also available for the areas of allied health occupations/practical nursing and cosmetology.) Tasks are coded to correspond to those on the Student Performance Record, which details a student's past performance. Units with objective and outline are listed for seven major blocks (and performance groups): (1) automotive service (introduction to handtools, chassis lubrication, servicing cooling and suspension systems), (2) hydraulic brakes, (3) engine overhaul (valve grinding and adjustment), (4) tune up and electrical (testing engine, testing and servicing battery, spark plug service, testing ignition coil and ignition condenser, testing distributor, testing charging system, testing starter motor, fuel systems), (5) small engines (repair), (6) marine engines (repair), and (7) automotive emission controls (testing and repair). The document concludes with a task cross-listing index. (Domain referenced tests for skills and theory are available separately as CE 027 746 and CE 027 747.) (YLB)

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STUDENT ASSESSMENT SYSTEM

Developed Under Contractual Agreement with

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Georgia Department of Education
Atlanta, Georgia 30334
Charles McDaniel, State Superintendent of Schools
1980

Developed By

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under the direction of

Dr. Paul Scott

Vocational Education Materials Center

Division Of Vocational Education

College Of Education

The University Of Georgia

Dr. George L. O'Kelley, Jr.,

Division Chairman

Division of Vocational Education
College of Education
University of Georgia, Athens, Ga.

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PURPOSE OF THE CENTER

The Vocational Education Materials Center functions within the Division of Vocational Education, University of Georgia. This Center operates under grants from the U.S. Office of Education, and the Georgia State Department of Education with the support of the College of Education. The Center is comprehensive in its commitment and approach to the development and dissemination of materials in the broad field of Vocational Education.

The purpose of the Center is to increase the capability of Georgia's delivery system for Vocational Education. Specifically, the Center is committed to:

1. Develop materials to assist in the implementation of proposed curricula and to enhance the teaching of Vocational Education.

2. Conduct and report curriculum research related to Vocational Education.

3. Provide a production and dissemination center for Vocational Education materials.

4. Provide direct experiences in curriculum development and diffusion for advanced graduate students.

5. Enable faculty members to participate in the development and implementation of a variety of curriculum materials.

Dr. G. L. O'Kelley, Jr.; Chairman
Division of Vocational Education
628 Aderhold Hall
University of Georgia
Athens, Georgia 30602

TRANSPORTATION CLUSTER

Introduction

The student performance record is designed to be used by receiving post-secondary vocational schools in their process of evaluating a student's past performance in order to grow advanced credit. The record will also be helpful to other groups of people interested in evaluating the skills obtained by a student while in either a secondary or post-secondary vocational program.

Georgia high schools who offer the transportation program are beginning the training of individuals for successful employment as mechanics, primarily for the State of Georgia. The content of the curriculum used in the comprehensive high schools in the state to prepare these individuals is reflected in the student performance record and in this document which may be used for explanation purposes. The curriculum reflected here contains not only the skills and knowledge necessary to satisfy the educational requirements of the state of Georgia, but also the skills, knowledge and attitudes needed to be successful in a service occupation such as automotive mechanics.

Task Listing

The following list gives the tasks taught in the transportation cluster programs in the comprehensive high schools of Georgia. The list was developed by Georgia teachers using traditional task analysis methods.

The task list will tell the reader what the student in the transportation cluster should be able to do upon entering an employment situation or upon entering a post-secondary school. The tasks reflected on the student performance record are in most instances broken into sub-units which appear in a coded form (i.e. HT-03, TSC-11, etc.). Therefore, this

booklet is required for interpretive purposes.

Using The Task Detailing

To aid in interpreting the Student Performance Record, the tasks in this booklet are identified with the same code numbers as those on the Student Performance Record. The performance record is coded in order to make the record more compact, and easier to store and transport. To identify a specific task on the performance record, locate the Major Block and Performance group in the task detailing Table of Contents. The page number for each task is identified. Turn to that page to locate the task, the objective, and the task components (learning steps).

In addition to the task list which is broken down into components (learning steps), a cross listing between secondary and post-secondary learning unit (package) titles is presented. This cross listing is necessary due to the fact that different codes and unit titles are used in the secondary and post-secondary schools. As an example in the post-secondary schools unit number 211-17 "Reconditioning and installing rocker arms and adjusting valves" is the same as the secondary unit VGA-12 "Installing rocker arms and adjusting valves." In another case, the post-secondary unit number 201-4 "Testing and servicing a storage battery" corresponds with five secondary units TSB 1 through TSB 5. They range in content from testing battery gravity to charging the battery.

In many cases, the curriculum materials used in secondary and post-secondary schools in Georgia cover the same tasks in just as great a depth. They will, however, have different titles and code numbers making it difficult for a post-secondary teacher to interpret the student performance record for a secondary student which gives notations based upon curriculum titles and numbers used only on the secondary level.

In addition to the above, even if the secondary or post-secondary program does not use or is not familiar with the curriculum materials furnished by the state, the student performance record may still be used. The Task List gives the task name, its learning steps, and an instructional objective which should make relating to the task statements and code numbers much easier.

Performance Rating Scale

Beside the task code numbers on the student performance record are two blanks. The first blank will be used by the high school teacher and the second blank by the post-secondary teacher as they give the student a proficiency rating.

For the readers convenience, the rating portion of the student performance record is shown here:

Rating	Level of Performance
1	Degree of skill below minimum performance level
2	Acceptable level of skill; can perform with supervision and/ or assistance
3	High level of skill; can perform independently and consistently at a high level

The rating on this performance record gives the entry level skills this student has demonstrated based on set standards or criteria. This record is intended for use in assessing the student's ability for employment or advanced educational purposes. An item left unmarked indicates the student has not received instruction. The first blank indicates the secondary rating--the second blank is the post secondary rating.

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TASK LIST

MAJOR BLOCK: AUTOMOTIVE SERVICE

PERFORMANCE GROUP: HANDTOOLS

HT-1 Introduction to Handtools

Objective: Given 25 of the most common handtools used in automobile repair, identify the tools. Twenty out of 25 must be correctly identified.

A. Types of handtools
B. Types of electric handtools
C. Types of air handtools
D. Safety precautions
E. Special tools
F. Securing tools and equipment

HT-2 Demonstrating Basic Handtool Use

Objective: Given 10 basic handtools used in automobile repair, demonstrate the safe and correct use of each tool.

A. Fundamentals of auto servicing
B. Tools and equipment
C. Safety precautions
D. Servicing procedure
E. Cleaning and storing equipment

HT-3 Making a Thread Block Gauge

Objective: Given specifications and the necessary tools and equipment, make a thread gauge block. All threaded holes must be at right angles to the gauge block and bolts must turn freely in each threaded hole.

A. Bolt and nut types
B. Thread sizes and classes
C. Taps and how to use
D. Dies and how to use
E. Drill motors
F. Drill bits and sharpening
G. Tap drill sizes
H. Decimal Equivalent Charts
I. Safety precautions
J. Sharpening punches and chisels
K. Making a thread gauge block
L. Securing tools and equipment

HT-4 Removing Broken Stud and Installing Helicoil

Objective: Given an engine cylinder block with a broken stud bolt, remove the broken stud from the cylinder block and install a helicoil insert.

A. Special tools and equipment
B. Stud removal procedures
C. Easy-out screw removers
D. Helicoil inserts
E. Procedure in installing helicoil
F. Installation of insert
G. Cleaning work area and storing equipment

HT-5 Cutting and Double Flaring Copper Tubing

Objective: Given copper tubing, fittings, and the necessary tools and equipment, cut and double flare copper tubing.

A. Tools and equipment
B. Safety precautions
C. Cut and flaring procedure
D. Cutting and flaring copper tubing
E. Cleaning and storing equipment

HT-6 Shop Safety

Objective: Demonstrate your knowledge of general shop safety by listing 10 shop safety rules and stating one reason why each rule is important.

A. Shop safety procedure
B. Safety precautions
C. Cleaning methods
D. Tools and equipment
E. Purpose of safety rules

PERFORMANCE GROUP: CHASSIS LUBRICATION

CL-1 Using the Twin Post Hoist

Objective: Given an automobile and a twin post hoist, correctly and safely raise the automobile.

A. Twin lift hoist
B. Safety precautions
C. Manufacturer's specifications
D. Adjusting twin lift hoist
E. Securing work area

CL-2 Change Oil and Oil Filter

Objective: Given an automobile in need of an oil and filter change, service the engine lubrication system. The correct type of oil and filter must be selected, and the oil pan plug or filter must not leak.

A. Types of oil filters
B. Lubrication procedure
C. Manufacturer's specifications
D. Safety precautions
E. Removing and re-installing filter and oil
F. Checking for leaks
G. Securing work area and equipment

CL-3 Lubricate Chassis

Objective: Given an automobile, lubrication specifications, lubricate the chassis. All lubrication points must be lubricated with the correct type and amount of lubricant without damage to any seals or dust boots.

A. Chassis lubrication specifications
B. Twin lift hoist
C. Safety precautions
D. Manufacturer's specifications
E. Lubricate without damaging rubber seals
F. Filling out lube sticker
G. Storing tools and equipment

CL-5 Change Automatic Transmission Fluid

Objective: Given an automobile with an automatic transmission, drain the transmission fluid and refill the transmission to the proper level with the correct type of fluid.

A. Manufacturer's in-car service recommendation
B. Transmission fluids
C. Replacement procedure
D. Filling with fluid

E. Road testing
F. Checking for leaks
G. Cleaning work area and tools

CL-6 To Pack Front Wheel Bearings (with drum type brakes)

Objective: Given an automobile with drum type brakes, pack the front wheel bearings. The bearings must be cleaned, inspected for wear and/or flaws, re-packed with the proper lubricant (by hand or pressure), and re-installed according to the manufacturer's specifications.

A. Types of wheel bearings
B. Types of lubricants
C. Cleaning methods
D. Safety precautions
E. Adjusting procedures
F. Servicing procedures
G. Servicing wheel bearings
H. Cleaning work station and equipment

CL-7 Pack Front Wheel Bearings (with disc brakes)

Objective: Given an automobile with disc brakes, pack the front wheel bearings. The bearings must be cleaned, inspected for wear and/or flaws, repacked with the proper lubricant (by hand or pressure) and re-installed according to the manufacturer's specifications.

TASK LIST

MAJOR BLOCK: AUTOMOTIVE SERVICE

PERFORMANCE GROUP: SERVICING COOLING SYSTEMS

SCS-1 Check Anti-Freeze and Pressure Test Cooling System

Objective: Given an automobile and the necessary tools and equipment, determine the cooling system condition and antifreeze content, and recommend the needed cooling system service if needed.

A. Radiator types and construction
B. Heat transfer methods
C. Types of coolants and additives
D. Thermostat and pressure caps
E. Types of cooling fans
F. Water pump operation
G. Safety precautions
H. Troubleshooting procedures
I. Servicing cooling system
J. Cleaning and storing equipment

SCS-2 Servicing the Cooling System

Objective: Given proper manufacturer's manual(s), the necessary tools and equipment, service and winterize the cooling system on a designated vehicle. The engine must operate at the normal temperature and the cooling system must not leak.

A. Manufacturer's Manuals
B. Radiator types and construction
C. Heat transfer methods
D. Types of coolants and additives
E. Thermostats and pressure caps
F. Types of cooling fans
G. Water pump operation
H. Safety precautions
I. Troubleshooting procedures
J. Servicing cooling system
K. Cleaning and storing equipment

SCS-3 Replace Radiator and Heater Hose

Objective: Given the necessary tools and supplies, locate and replace the defective hoses on a designated vehicle. All defective hoses and the specific defect must be identified, defective hose(s) must be replaced and the cooling system must be able to withstand 14 P.S.I. without leaks.

A. Manufacturer's manuals
B. Safety precautions
C. Troubleshooting procedures
D. Replacing hoses
E. Pressure test cooling system
F. Cleaning and storing equipment

SCS-4 Remove and Replace Radiator

Objective: Given proper manufacturer's manuals, the necessary tools and equipment, remove and replace the radiator on a designated vehicle. Needed repairs must be noted and completed and the replaced radiator must be free of leaks.

A. Manufacturer's manuals
B. Safety precautions
C. Troubleshooting procedures
D. Remove and replace radiator
E. Pressure test cooling system
F. Cleaning and storing equipment

SCS-5 Replace Thermostat and By-Pass Hose

Objective: Given the proper manufacturer's manuals, the necessary tools and equipment, replace the thermostat and by-pass hose on a designated vehicle. The replaced thermostat must be the correct type and temperature range for the vehicle and the system must withstand at least 14 P.S.I. without leaking.

A. Manufacturer's manual
B. Safety precautions
C. Thermostats and pressure caps
D. Water pump operation
E. Replace thermostat
F. Replace by-pass hose
G. Pressure test cooling system
H. Cleaning and storing equipment

SCS-6 Replace and Adjsut Drive Belts

Objective: Given necessary supplies and equipment, and specifications, replace and adjust specified drive belts on a designated vehicle. The drive belts must be adjusted to specifications.

A. Manufacturer's manuals
B. Safety precautions
C. Remove and replace belts
D. Adjust belt to manufacturer's specifications.
E. Cleaning and storing equipment

SCS-7 Replace Water Pump and Check Fan Clutch

Objective: Given manufacturer's manuals and the necessary tools and equipment, replace the water pump and check fan clutch on a designated vehicle. Water pump malfunctions must be diagnosed, fan clutch must be tested for normal operations, and the water pump must be replaced according to manufacturer's recommended procedures.

A. Manufacturer's manuals
B. Types of cooling fans
C. Water pump operation
D. Safety precautions
E. Troubleshooting procedures
F. Servicing cooling system
G. Cleaning and storing equipment

SCS-8 Check Temperature Gauge, Remove and Replace Block Unit

Objective: Given the proper tools, equipment and supplies, check the temperature gauge and remove and replace the block unit on a designated vehicle. The temperature gauge must indicate the proper temperature following the replacement of the block unit.

A. Manufacturer's manual
B. Troubleshooting procedures
C. Safety precautions
D. Remove and replace block unit
E. Servicing cooling system
F. Cleaning and storing equipment

TASK LIST

MAJOR BLOCK: AUTOMOTIVE SERVICE

PERFORMANCE GROUP: SERVICING SUSPENSION SYSTEM

SSS-1 Inspect and Rotate Tires

Objective: Given a vehicle with tire wear problems, analyze the tire wear problems and rotate the tires. The tires must be rotated in the proper sequence and the lug bolts must be torqued to specification.

A. Manufacturer's specifications.
B. Safety precautions.
C. Tire rotation.
D. Twin lift hoist.
E. Torque wheel nuts.
F. Check tire pressure and install wheel covers.
G. Secure tools and work area.

SSS-2 Static or Bubble Balance Wheels

Objective: Given a vehicle with wheels out of balance, static or bubble balance the wheels. Tire vibration must be within designated limits when checked with a tire spinner.

A. Purpose of wheel balancing.
B. Types of balancers
C. Wheel weights.
D. Safety precautions
E. Wheel bearing service procedure
F. Balancing procedure
G. Balancing front wheels

SSS-3 Dismount and Remount a Tire

Objective: Given a wheel with a leaky tube type or tubeless tire, dismount the tire, diagnose any leak down problem(s), repair and remount the tire. The tire must not leak when remounted.

A. Tire changer set-up
B. Safety precautions
C. Dismount tire and inspect and repair
D. Balancing procedure
E. Storing tools and equipment

SSS-4 Repair an Inner Tube

Objective: Given an inner tube with an air leak, locate and repair the air leak. The tube must not leak air following the repair.

A. Tire changer set-up
B. Safety precautions
C. Dismount tire and inspect for leak
D. Repair tube procedure
E. Test tube for leaks after repairing
F. Remount tube in tire
G. Balancing procedure
H. Storing tools and equipment

SSS-5 Repair a Tubeless Type Tire

Objective: Given a wheel with a tubeless tire that has an air loss locate the cause of the air loss and repair the problem. The air loss problem must be solved.

A. Types of tubeless tires
B. Safety precautions
C. Inspect for cause of air loss and repairing
D. Testing procedure
E. Cleaning work area and tools

SSS-6 Speed Balance a Wheel on the Car

Objective: Given an automobile with an out-of-balance wheel, speed balance the wheel on the car. The unbalanced condition must be eliminated.

A. Purpose of wheel balancing
B. Types of balancers
C. Wheel weights
D. Safety precautions
E. Wheel bearing service procedures
F. Balancing procedures
G. Speed balance wheels
H. Clean tools and work area

SSS-7 Inspect Front Suspension

Objective: Given a vehicle with front suspension problems, inspect all suspension components. Analyze the inspection results and recommend the needed repairs to restore the system to its originial condition. Analysis and recommendation must be correct.

A. Wheel alignment equipment
B. Equipment storage
C. Manufacturer's specifications
D. Special alignment tools
E. Alignment procedures
F. Safety precautions
G. Special instrucitons on road testing
H. Checking and aligning the front end
I. Cleaning work area and tools

SSS-8 Aligning Front Suspension

Objective: Given a vehicle with all alignment angles adjusted out of specifications, restore each angle to that which is recommended by the vehicle manufacturer. Tolerance must be within that shown on the alignment angle specification sheet. Steering wheel spoke position must be straight and vehicle must not pull in either direction on a uniform U.S. Highway.

A. Conventional front suspension
B. Types of independent front suspension
C. Rear suspension
D. Steering linkage
E. Inspection reports and specs
F. Safety precautions
G. Inspections procedures
H. Inspecting vehicle
I. Filling out inspection reports
J. Cleaning work area and tools

TASK LIST

MAJOR BLOCK: BRAKES

PERFORMANCE GROUP: HYDRAULIC BRAKES

HB-1 Checking the Brake System Condition and Operation

Objective: Given an automobile with brake problem(s), check the brake system condition and operation and recommend the needed service.

A. Vehicle hoisting equipment
B. Safety precautions
C. Brake testing equipment
D. Road testing
E. Special instructions
F. Checking brake system
G. Checking fluid and power unit
H. Checking lights
I. Machine testing brakes
J. Road testing brakes

HB-2 Overhauling Master Cylinder

Objective: Given a vehicle equipped with tandem cylinder, remove, overhaul, install, and bleed the cylinder. The brake pedal free travel and pedal reserve must meet specifications. The pedal must be firm to the touch.

A. Brake system fundamentals
B. Types of master cylinders
C. Types of brake fluids
D. Cleaning solutions
E. Safety precautions
F. Manufacturer's specifications
G. Steps in overhauling
H. Overhauling cylinder
I. Bench testing
J. Installing and bleeding
K. Checking and adjusting pedal
L. Road testing
M. Securing area

HB-3 Overhauling and/or Replacing Wheel Cylinders

Objective: Given vehicle with a defective wheel cylinder, locate the defective cylinder, and overhaul and replace cylinder. Cylinder must be honed only to clear pits, but not more than .005 oversize.

A. Types of wheel cylinders
B. Wheel cylinder operation
C. Manufacturer's specifications
D. Special instructions
E. Steps in removing and overhauling wheel cylinder
F. Removing and overhauling cylinder
G. Installing cylinder and bleeding brakes
H. Checking system
I. Securing work areas

HB-4 Turning Brake Drum

Objective: Given one brake drum mounted on front hub and one floating brake drum, mount and turn each drum to manufacturer's acceptable standards. Drum must be round and smooth with no threading effect.

A. Types of brake drums
B. Turning equipment procedures
C. Inspection procedures
D. Causes of improper wear
E. Safety precautions
F. Turning brake drum
G. Cleaning lathe and storing attachments

HB-5 Cam or Radius Grind Brake Shoe

Objective: Given an oversize brake drum, measure the drum, select oversize shoe, set up brake shoe grinder, and grind brake shoe to fit drum. Shoe to have .010 heel and toe clearance.

A. Types of brak linings
B. Types of lining mounting
C. Friction
D. Brake shoe grinding equipment and procedures
E. Grinding brake shoes to fit drum
F. Testing shoes for fit
G. Cleaning equipment and work areas

HB-6 Replacing Brake Shoes

Objective: Given a current model front and rear foundation brake assembly, replace brake shoes, recondition brake flange, replace springs as necessary, and adjust brake for proper contact.

A. Types of foundation brakes
B. Principle of operation
C. Brake adjustment procedure
D. Causes of brake fading
E. Special instructions
F. Replacing brake shoes
G. Cleaning work area and securing tools

HB-7 Bleeding Brake System

Objective: Given a vehicle and the necessary tools and equipment, pressure bleed the vehicle brake system. Brake pedal must be firm when depressed; pedal reserve to meet specifications. Brake system warning light must operate correctly.

A. Brake bleeding methods
B. Pressure bleeders
C. Fluid requirements
D. Safety precautions
E. Bleeding procedure
F. Bleeding system
G. Inspecting and testing system
H. Storing tools and equipment

HB-8 Grinding Brake Drums

Objective: Given a brake drum with work hardened spots that cannot be machined, set up the brake drum grinder and grind drum to remove hard spots. Drum must be ground to a smooth finish and be within manufacturer's oversize limits.

A. Purpose of grinding
B. Types of grinders
C. Safety precautions
D. Grinding procedures
E. Storing equipment and cleaning area

HB-9 Replacing Front Disc Pads

Objective: Given a vehicle equipped with front disc brakes, replace pads and bleed brake system. Brake pedal must be firm with pedal reserve within manufacturer's limits. Brake effort must be equal on both front wheels.

A. Disc brake fundamentals
B. Safety precautions
C. Procedure for replacing pads
D. Replacing pads
E. Inspecting and testing brake system
F. Cleaning work area and equipment

HB-10 Overhauling Brake System

Objective: Given a vehicle with a defective brake system, inspect the system, analyze results and perform a brake system overhaul. The system must operate correctly with the specified pedal reserve.

A. Brake system overhauling procedures
B. Safety precautions
C. Overhauling master and wheel cylinders
D. Turning and grinding brake drums
E. Replacing pads
F. Replacing shoes
G. Inspecting and testing brake system
H. Cleaning work area and equipment

HB-11 Grinding Brake Rotors

Objective: Given several disc brake rotors select one that needs machining and machine the rotor. The rotor must meet manufacturer's specifications.

A. Heat spots in rotor
B. Rotor grinder
C. Grinding brake rotors
D. Grind brake rotors

TASK LIST

MAJOR BLOCK: ENGINE OVERHAUL

PERFORMANCE GROUP: VALVE GRINDING AND ADJUSTMENT

VGA-1 Removing, Disassembling and Cleaning Cylinder Head

Objective: Given an automotive engine, remove and disassemble the head. The head and related parts must be cleaned, laid out in order of removal, and labeled with appropriate names.

A. Locate proper reference manual
B. Select tools
C. Remove rocker arm and mounting
D. Remove push rods
E. Remove cylinder head
F. Inspect cylinder heads
G. Remove valves
H. Remove valve stem and guide seal
I. Clean cylinder head
J. Check cylinder head for warpage

VGA-2 Inspecting and Adjusting Valve Grinding Machine

Objective: Given a Sioux valve grinding machine for refacing valves, inspect and adjust the machine for refacing valves. The machine must be set to face valves for a one degree interference angle.

A. Adjust shield and tool rest of bench grinder
B. Clean valves
C. Polish valve stem
D. Measure valve stem
E. Adjust valve grinding machine
F. Lubricate machine
G. Inspect machine cord
H. Inspect and replace grinding stone

VGA-3 Dressing a Grinding Stone

Objective: Given a valve grinding machine, dress the grinding stone. The stone must be dressed to manufacturer's specifications.

A. Inspect the valve grinding machine and the valve grinding wheel
B. Mount and adjust the stone dressing tool
C. Dress the valve refacing stone
D. Secure the work station

VGA-4 Grinding Valves

Objective: Given an assortment of exhaust and intake valves, set up the valve grinding machine and reface the valves. The valves must be ground for a one-degree interference angle. Determine if the refaced valves have the specified margin.

A. Select and place the proper shield
B. Set valve depth
C. Install valve for grinding
D. Adjust coolant
E. Adjust grinding wheel
F. Grind valve
G. Clean valve face
H. Measure valve

VGA-5 Squaring off and chamfer valve stems

Objective: Given an assortment of exhaust and intake valves, square off and chamfer the valve stems. The stems must not be ground more than .010 and the chamfer width must be 1/32".

A. Mount valve stem in V-Block
B. Adjust micrometer scale
C. Square off the stem
D. Chamfer the stem

VGA-6 Reconditioning Valve Guides

Objective: Given a cylinder head with valve guides needing reconditioning, recondition assigned valve guides. The valve stem clearance must be within manufacturer's specified limits.

A. Select the correct size stone
B. Select a stone drive
C. Insert and adjust stone on driver
D. Select stone dress and holding fixture
E. Adjust to proper angle
F. Determine correct valve seat angle
G. Adjust diamond cutter
H. Ream valve guide if necessary

VGA-7 Grinding and Sizing Valve Seats

Objective: Given a cylinder head with valve seats that need grinding and sizing, grind and size the valve seats. Seat finish angle, width and runout must meet engine manufacturer's specifications.

VGA-7 cont'd

A. Select tapered pilot
B. Grind the seat
C. Check for cracks or runout on the valve seat
D. Install valve guide seal

VGA-8 Assembling Valves

Objective: Given a disassembled cylinder head, determine if the valve springs are servicable and assemble the cylinder head. Springs must be tested for correct length, squareness and tension. Valve spring assembled height must meet manufacturer's specifications.

A. Lubricate the valve stem
B. Install valve guide
C. Lubricate exposed end of the valve stem and machined part of the valve guide
D. Use valve guide seal
E. Place seal
F. Install valve spring retainer
G. Compress valve spring
H. Place ring seal
I. Insert valve
J. Insert valve lock

VGA-9 Installing Cylinder Heads

Objective: Given an engine and the proper cylinder head, install the cylinder head. Head bolts must be torqued in the proper sequence to the manufacturer's specified torque.

A. Coat gasket with sealer
B. Install guide pins
C. Fit gasket over guide pins
D. Place cylinder head
E. Install cylinder head bolts
F. Remove guide pins
G. Tighten cylinder head bolts

VGA-10 Removing and Cleaning Valve Lifters

Objective: Given a mechanical and a hydraulic valve lifter, clean and inspect the lifters. The lifters must be clean and any unserviceable lifters must be identified.

A. Reassembling and replacing lifters
B. Inspect lifters for excessive wear
C. Disassemble lifters
D. Remove lifters
E. Clean lifters
F. Inspect for pits and burs
G. Sand built up deposits
H. Dry lifters with air
I. Reassemble lifters

VGA-11 Reassembling Valve Lifters

Objective: Given a hydraulic valve lifter, reassemble and bench test the lifter. The lifter must be correctly reassembled and bench tested.

A. Place check ball, springs and retainers
B. Perform dry air check on lifters
C. Bleed air from lifters

VGA-12 Installing Rocker Arms and Adjusting Valves

Objective: Given an automotive engine without rocker arms and valves, install the rocker arms. The rocker arm mounting bolts must be tightened to specifications in the recommended sequence.

A. Lubricate lifters
B. Inspect rocker arms for damage and wear
C. Inspect shaft for excessive wear
D. Polish shaft
E. Install rocker arms and valves
F. Adjust rocker arms and valves

TASK LIST

MAJOR BLOCK: TUNE-UP AND ELECTRICAL

PERFORMANCE GROUP: TESTING ENGINES

STE-1 Calibrating the Sun Ten-Twenty Testing

Objective: Given a Sun Ten-Twenty tester, calibrate the tester. The tester must be calibrated to the specifications in the operation manual.

A. Inspect 3-prong plug
B. Check cord for frayed places
C. Set voltage switch
D. Set engine cycle switch
E. Set scope trigger switch
F. Set pattern switch
G. Set dwell switch
H. Calibrate dwell meter
I. Set RPM selector
J. Adjust scope pattern
K. Adjust brightness and focus
L. Adjust horizontal and vertical

STE-2 Making Connections for Different Attachments on the Sun Ten-Twenty Tester

Objective: Given a calibrated Sun Ten-Twenty Tester and an automotive engine, connect the tester to the engine. All controls and connections must be in the correct positions for the engine to be tested.

A. Lay out secondary pick up attachments
B. Disconnect coil center lead
C. Connect positive lead to the distributor
D. Connect negative lead to ground
E. Connect voltmeter
F. Connect pick up attachments
G. Connect trigger attachments

STE-3 Performing Engine Tests with the Sun Ten-Twenty Tester

Objective: Given a vehicle, a Sun Ten-Twenty Tester, and a Sun Engine Diagnosis check sheet, record the specifications for each test on the check sheet, perform and record the

A. Read battery cranking voltage
B. Check coil output
C. Plug wire into distributor
D. Set circuit selector switch
E. Set pattern selector

STE-4 Identifying Scope Patterns

Objective: Given a vehicle that has at least two problems in the ignition system that will cause abnormal scope patterns, identify and analyze both problems from the clues obtained by viewing the scope patterns. The problems must be correctly identified.

A. Set engine RPM's
B. Identify pattern for defective points
C. Identify distributor cam error pattern
D. Identify firing section phase of pattern
E. Identify intermediate section of phase of pattern
F. Identify dwell section of pattern
G. Identify raster pattern for cylinder
H. Use raster spacing
I. Identify pattern for worn breaker plate or bushing

STE-5 Testing Firing System with a Sun Ten-Twenty Tester

Objective: Given an automotive engine, a Sun Ten-Twenty Scope, and an assignment sheet, test the firing system. Ninety percent of the check on the assignment sheet must be correctly analyzed.

A. Set display
B. Center pattern
C. Identify firing order with pattern
D. Set pattern length control knob
E. View cylinders individually
F. Check coil output
G. Identify intermediate oscillation
H. Identify point close in dwell section
I. Test wire insulation

STE-6 Running Power Balance Test on Engine

Objective: Given an automotive engine and a Sun Ten-Twenty Tester, run a power balance test and analyze the results. The analysis must be correct on at least 75% of the cylinders.

A. Adjust electro cylinder selector
B. Read RPM drop
C. Use resistor probe
D. Read RPM drop

STE-7 Analyzing Exhaust

Objective: Given a vehicle and a combustion type analyzer, analyze the exhaust. The fuel-air ratio must be correctly measured.

A. Connect voltmeter leads
B. Adjust combustion calibrator
C. Connect exhaust pick up attachment
D. Read combustion meter
E. Read engine vacuum
F. Read combustion efficiency
G. Test ignition and fuel system
H. Analyze exhaust for hydrocarbons and carbon monoxide.

STE-8 Analyzing Exhaust

Objective: Given a vehicle and necessary test equipment, performance test the engine operation and exhaust emission The exhaust must be correctly analyzed for hydrocarbons and carbon monoxide and problems with the ignition and fuel system must be correctly analyzed.

A. Connect voltmeter leads
B. Adjust combustion calibrator
C. Connect exhaust pick up attachment
D. Read combustion meter
E. Read engine vacuum
F. Read combustion efficiency
G. Test ignition and fuel system
H. Analyze exhaust for hydrocarbons and carbon monoxide.

STE-9 Analyzing Exhaust

Objective: Given an engine with uneven compression and the necessary test equipment perform a cylinder leakage test, and a wet and dry compression test. The test results must be correctly analyzed and the necessary repairs needed to restore the engine to normal condition must be determined.

A. Connect voltmeter leads
B. Adjust combustion calibrator
C. Connect exhaust pick up attachment
D. Read combustion meter
E. Read engine vacuum
F. Read combustion efficiency
G. Test ignition and fuel system
H. Analyze exhaust for hydrocarbons and carbon monoxide
I. Test engine internal condition
J. Analyze test results

TASK LIST

MAJOR BLOCK: TUNE-UP AND ELECTRICAL

PERFORMANCE GROUP: TESTING AND SERVICING BATTERY

TSB-1 Testing Battery Gravity

Objective: Given two 12-volt batteries test the specific gravity of each battery. The test results must be correct for each cell.

A. Hydrometer
B. Perform specific gravity test
C. Battery checker
D. Perform light load test
E. Cell probes
F. Perform cell probe test
G. Capacity tester
H. Perform capacity test

TSB-2 Performing Light load Test on a Battery

Objective: Given a vehicle with the head lamps wired for use, perform a light load test on the battery and analyze the test results. The analysis must be correct.

A. Hydrometer
B. Perform specific gravity test
C. Battery checker
D. Perform light load test
E. Cell probes
F. Perform cell probe test
G. Capacity tester
H. Perform capacity test

TSB-3 Testing a Battery for Capacity

Objective: Given a vehicle, perform a capacity test on the battery and analyze the test results. The analysis must be correct for each battery cell.

A. Hydrometer
B. Performing specific gravity test
C. Battery checker
D. Perform light load test
E. Cell probes
F. Perform cell probe test
G. Capacity tester
H. Perform capacity test

TSB-4 Cleaning the Battery, the Connections and the Cables

Objective: Given an automobile with a dirty battery, clean the battery, connections, cables and case. All items must be free of grease and corrosion.

A. Remove cables and clean
B. Remove battery
C. Clean battery

TSB-5 Charging and Installing a Battery

Objective: Given a vehicle with a weak battery, remove the battery, perform a three minute charge and reinstall the battery. All connections must be tight and the battery must produce enough current to start the vehicle.

A. Battery charger
B. Performing a 3 minute charge
C. Performing a full charge
D. Charge the battery
E. Installing a battery
F. Install the battery

TASK LIST

MAJOR BLOCK: TUNE-UP AND ELECTRICAL

PERFORMANCE GROUP: SPARK PLUG SERVICE

SPS-1 Removing Spark Plugs From The Engine

Objective: Given an automotive engine, remove the spark plugs and analyze the spark plug deposits. The spark plug deposits must be correctly analyzed.

A. Remove spark plug wire
B. Loosen spark plug and remove
C. Blow away carbon deposit
D. Inspect spark plugs for types of fouling
E. Replace spark plugs
F. Replace spark plug wires

SPS-2 Cleaning Spark Plugs

Objective: Given the set of spark plugs removed in SPS-1 and a spark plug cleaner, clean the plugs. All carbon deposits must be removed without damage to the electrodes or insulation.

A. Connect spark plug cleaner to air supply
B. Fit spark plugs to adapters
C. Open spark plug gap
D. File electrodes
E. Remove sealing ring or gasket from the spark plug
F. Insert plug in top of cleaner
G. Wobble plug and apply sand blast
H. Inspect plug
I. Clean outside of plug
J. Inspect plug

SPS-3 Gaping Spark Plugs

Objective: Given the set of spark plugs used in SPS-1 and 2, gap the spark plugs. The gap must be set within plus or minus .003 of the specifications and the ground electrode must be set parallel to the center electrode.

A. Adjust ground electrode to be parallel with center electrode
B. File the electrodes
C. Find plug specifications
D. Gap the plug
E. Measure the gap with a wire feeler gauge

SPS-4 Testing Spark Plugs

Objective: Given a set of eight spark plugs with at least two defective, determine which plugs are defective. The defective plugs must be identified.

A. Clean and dry spark plug insulators
B. Check new plugs in the tester
C. Check reconditioned plugs in the tester
D. Compare new and reconditioned plugs

SPS-5 Installing Spark Plugs and Determining Polarity

Objective: Given an automotive engine, test the spark plugs for correct polarity with (1) a scope, (2) a voltmeter and (3) a pencil. The polarity of each plug must be determined with each method.

A. Identify spark plug corona
B. Install new sealing ring where applicable
C. Use torque wrench to tighten spark plugs where possible
D. Test for correct polarity of spark plugs with scope
E. Voltmeter test spark plugs for correct polarity
F. Pencil test spark plugs for correct polarity
G. Make sure wires are properly connected.

TASK LIST

MAJOR BLOCK: TUNE-UP AND ELECTRICAL

PERFORMANCE GROUP: TESTING IGNITION COIL AND CONDENSER

TIC-1 Testing Ignition Coil and Condenser

Objective: Given three ignition coils and the necessary test equipment, test the ignition coils for opens, shorts, polarity, resistance and reserve output and analyze all test results. All test results must be correctly analyzed.

A. Volt dwell unit for coil testing
B. Test primary resistance
C. Test secondary resistance
D. Test coil output
E. Test reserve output
F. Test reverse polarity
G. Test for shorts
H. Test for opens
I. Inspect equipment test leads
J. Volt dwell unit for condenser testing

TIC-2 Testing The Condenser

Objective: Given three ignition system condensers, specifications, and the necessary test equipment, test the condensers for series resistance, leakage, and capacity. All test results must be correct.

A. Check electrical leads on test equipment
B. Set up test equipment
C. Calibrate equipment
D. Connect leads of equipment to condenser
E. Perform series resistance test
F. Perform condenser leakage test
G. Perform capacity check
H. Compare test results to manufacturer's specifications

TASK LIST

MAJOR BLOCK: TUNE-UP AND ELECTRICAL

PERFORMANCE GROUP: TESTING IGNITION DISTRIBUTOR

TID-1 Removing a Distributor

Objective: Given an operational engine, remove the distributor and relate how the distributor can be installed so the engine will start without having to reset initial timing. The installation instructions must be correct.

A. Set the timing mark top dead center on the compression stroke
B. Remove distributor cap
C. Mark rotor button location
D. Remove vacuum line
E. Pull distributor
F. Develop installation instructions

TID-2 Testing a Distributor

Objective: Given a distributor and a distributor specification sheet, perform the tests listed on the specification sheet. The results must be analyzed and the needed service recommended.

A. Mount distributor tester
B. Tighten distributor
C. Set speed controls
D. Calibrate meter
E. Read resistance on tack dwell meter
F. Measure spring tension

TID-3 Installing Points in a Distributor

Objective: Given an ignition distributor and the necessary equipment and materials, install and adjust points while the distributor is mounted in the tester. The points must be correctly aligned, spring tension must be correct, point gap correct and the distributor must be calibrated.

A. Use a feeler gauge
B. Use a dwell meter
C. Increase spring tension
D. Set dwell
E. Set mechanical advance
F. Set vacuum advance

TID-4 Installing a Distributor

Objective: Given an automobile and the correct distributor, install the distributor in the automobile. The engine must start and run without any major timing correction.

A. Check timing marks to see if they are still top dead center on the compression stroke
B. Place distributor in its mount
C. Bottom out distributor
D. Install distributor clamp bolt
E. Tighten distributor clamp bolt

TID-5 Setting the Timing

Objective: Given an automobile engine which is out of time and a strobe light, time the engine. The engine must be timed to the manufacturer's specifications.

A. Connect the timing light
B. Start the engine
C. Remove the vacuum line from the distributor
D. Observe timing mark with strobe
E. Loosen distributor hold down bolt
F. Adjust timing position by twisting distributor
G. Align timing mark and pointer

TASK LIST

MAJOR BLOCK: TUNE-UP AND ELECTRICAL

PERFORMANCE GROUP: TESTING CHARGING SYSTEM

TCS-1 Polarize and Troubleshoot a D.C. Generator

Objective: Given an operational D.C. generator, polarize and troubleshoot the generator. The polarity must be correct and generator defects must be determined.

A. Identifying "A" and "B" type generators
B. Polarize "A" type generator
C. Polarize "B" type generator
D. Test the "A" type system
E. Test the "B" type system

TCS-2 Replace and Adjust Drive Belts

Objective: Given an operational engine and the needed tools and a belt tension gauge, replace and/or adjust drive belts. The belts must meet manufacturer's specifications for tension and alignment.

A. Inspect belt
B. Remove belt
C. Replace belt
D. Adjust belt with tension gauge
E. Adjust belt without tension gauge

TCS-3 Inspecting and Testing an Alternator System

Objective: Given an engine with an alternator system, inspect and test an alternator. The field circuit test must be performed according to the procedure recommended in the manufacturer's operator's manual.

TCS-4 Performing Current Output and Circuit Resistant Tests

Objective: Given an engine with an alternator system, perform current output and circuit resistant tests and analyze the results of the tests. The analysis of the tests must determine whether the alternator is operating properly.

TCS-5 Removing An Alternator

Objective: Given an engine with an alternator, remove the alternator. The alternator must be removed following the procedures in the appropriate manufacturer's repair manual.

TCS-6 Bench Testing The Alternator

Objective: Given an alternator and an alternator/generator tester, bench test the alternator. The test results must be analyzed.

TCS-7 Disassembling An Alternator

Objective: Given an alternator, disassemble the alternator. The alternator must be disassembled following the procedure in the appropriate manufacturer's shop manual and each part must be identified.

TCS-8 Performing Rotor Tests and Stator Tests On An Alternator

Objective: Given a disassembled alternator and a test light, bench test the rotor and stator. Service recommendations must be made.

TCS-9 Testing Diodes

Objective: Given a set of six diodes, test the diodes. The positive and negative diodes must be separated and the defective diodes must be identified.

TCS-10 Assembling and Installing An Alternator

Objective: Given a disassembled alternator, assemble and install the alternator. The alternator must be tested for normal output before installation and must operate within manufacturer's specifications following installation.

TCS-3-10

A. Inspect alternator system
B. Test alternator system
C. Current output test
D. Circuit resistance test

TCS-3-10 (Con't)

E. Remove alternator
F. Bench test alternator
G. Disassemble alternator
H. Rotor tests
I. Stator tests
J. Test diodes
K. Reassemble alternator
L. Reinstall alternator

TCS-11-12 Testing and Adjusting An A.C.

Objective: Given an automotive engine with an alternator system, test and adjust the regulator. The charging voltage, current (amperage) and resistance must be within the manufacturer's specified range.

A. Test regulator output current
B. Test regulator output voltage
C. Test regulator system resistance
D. Adjust voltage regulator

TCS-13 Replacing an A.C. Regulator

Objective: Given an automotive engine with an alternator system, remove and replace the regulator. The regulator must be tested and adjusted to the manufacturer's specifications.

A. Remove leads
B. Remove bolts
C. Remove regulator
D. Install regulator
E. Test regulator
F. Adjust regulator

TASK LIST

MAJOR BLOCK: TUNE-UP AND ELECTRICAL

PERFORMANCE GROUP: TESTING STARTER MOTOR

TSM-1 Testing a Starter

Objective: Given an operational engine equipped with a functional starter and the necessary test equipment, perform an amperage draw and a resistance test. The test results must be recorded and analyzed.

A. Expanded scale voltmeter
B. Test for voltage drop between positive battery terminal and starter relay
C. Volt amp tester
D. Test for starter amperage draw

TSM-2 Stall and No-Load Testing a Starter Motor

Objective: Given an automotive engine equipped with a functioning starter, remove the starter and perform no-load and stall tests. The tests must be performed following the manufacturer's specified procedures.

A. Disconnect battery cables
B. Remove mounting bolts
C. Remove starter
D. Clamp starting motor in a vise
E. Install locking wedge
F. Volt amp tester
G. Stall test starter
H. Remove locking wedge
I. Install tachometer on starter shaft
J. No load test starter
K. Place starter in position on engine
L. Insert and tighten mounting bolts
M. Make electrical connections

TSM-3 Armature and Field Open and Grounded Circuit Test

Objective: Given a functional starter, and the necessary equipment, perform open and grounded circuit tests on the armature and field coils. The starter must be disassembled, cleaned inside and outside. The tests must be performed according to manufacturer's procedures and all open and/or grounded winding must be found.

A. Clean outside of starter
B. Disassemble starter
C. Clean inside of starter
D. Voltmeter
E. Test armature and field for open circuits
F. Test armature and field for grounded circuits

TSM-4 Testing Components and Assembling a Starter

Objective: Given a starter, test each starter component. Each defective part must be determined and replaced. The starter must operate according to manufacturer's requirements when installed on an automobile

A. Test component parts
B. Replace defective parts
C. Reassemble the starter
D. Bench test the atarter
E. Install the starter
F. Perform an on the car test

TASK LIST

MAJOR BLOCK: TUNE-UP AND ELECTRICAL

PERFORMANCE GROUP: FUEL SYSTEMS

FS-1 Cleaning and Repairing the Fuel

Objective: Given an automobile with a complete fuel system, clean and repair the system components. Each component must be cleaned and repaired.

A. Hoist vehicle
B. Disconnect electrical leads
C. Disconnect gas tank mounting
D. Remove insulation
E. Remove fuel gauge
F. Test fuel gauge sender
G. Use vacuum pump on lines
H. Service carbon cannister

FS-2 Testing and Replacing the Fuel Pump

Objective: The test results must be analyzed and a determination made as to whether the fuel pump is operating properly.

A. Set up safety equipment
B. Disconnect fuel lines
C. Dismount fuel gauge
D. Select fuel gauge kit adaptors
E. Pressure test fuel pump
F. Disconnect fuel pump
G. Remove fuel pump
H. Replace fuel pump

FS-3 Overhauling a Single Barrel Carburetor

Objective: Given a single barrel carburetor, overhaul the carburetor. The carburetor must be clean and operate properly when performance tested. Each carburetor part must be identified before reassembly.

A. Set up testing equipment and tools
B. Find specifications in manual
C. Disassemble carburetor
D. Clean carburetor parts
E. Dry carburetor parts

FS-3 contd.

F. Identify the carburetor parts
G. Reassemble the carburetor
   1. Adjust float level
   2. Measure float drop
   3. Adjust choke
   4. Adjust idle vent
   5. Adjust choke rod
   6. Adjust choke valve
   7. Adjust check valve
H. Install carburetor on engine
I. Performance test carburetor

FS-4 Adjusting an Overhauled Carburetor

Objective: Given an overhauled carburetor and an operational engine, install the carburetor and adjust to perform within the manufacturer's specifications.

A. Install the carburetor
B. Connect vacuum lines, fuel lines, and mechanical linkage
C. Connect the diagnostic equipment
D. Adjust carburetor

FS-5 Overhauling a Two Barrel Carburetor

Objective: Given a two barrel carburetor, overhaul the carburetor. The carburetor must be clean and operate properly when performance tested.

A. Remove vents and clips
B. Remove gaskets
C. Remove choke and piston
D. Remove pump system
E. Clean carburetor
F. Dry carburetor
G. Reassemble carburetor
   1. Replace filters
   2. Replace choke and valves
   3. Replace vents and clips
   4. Replace gaskets
   5. Replace choke and piston
   6. Replace pump system
H. Install carburetor
I. Connect vacuum lines, fuel lines, and mechanical linkage.
J. Connect the diagnostic equipment
K. Adjust carburetor
L. Performance test carburetor

FS-6 Repairing the Exhaust System

Objective: Given a vehicle with a defective exhaust system, diagnose the problem and repair the exhaust system. The diagnosis and service procedures must be in accordance with manufacturer's requirements. The exhaust system must not leak or rattle when performance tested.

A. Inspect exhaust system
B. Lubricate heat riser
C. Use penetrating oil on clamp volt
D. Cut and fit pipes
E. Install pipes
F. Performance test the exhaust system

TASK LIST

MAJOR BLOCK: SMALL ENGINES

PERFORMANCE GROUP: SMALL ENGINE REPAIR

SE-1 Two and Four Cycle Engine Operation

Objective: Given appropriate models of two-cycle and four cycle engines demonstrate operation principles of each.

A. Types of engines
B. Small engine principles
C. Engine components
D. Engine operation

SE-2 Features of Small Engines

Objective: Demonstrate an understanding of the distinguishing features of small engines through successful completion of a written examination.

A. Types of small engines
B. Features of small engines
C. Operation of small engines

SE-3 Disassembling a Small Engine

Objective: Given a small engine and the needed tools and references the student will disassemble the engine according to the manufacturer's suggested procedures and identify each component of the engine.

A. Types of small engine service manuals
B. Selection of tools
C. Procedures in disassembly of an engine
D. Disassembly of an engine
E. Parts of an engine
F. Labeling parts of an engine

SE-4 Reassembling Small Engines

Objective: Given a disassembled engine and the proper tools, assemble the engine according to the manufacturer's recommended procedures. The engine must start and run properly.

A. Selection of tools
B. Procedure in reassembly of an engine
C. Reassembly of engine

SE-5 Small Engine Lubrication System

Objective: Given an appropriate small engine demonstrate a knowledge of the lubrication system (in writing and by changing oil in an engine).

A. Selecting crankcase oil
B. Selecting tools and materials needed for an oil change
C. Prepare engine for oil draining
D. Drain crankcase
E. Prepare engine for refilling of crankcase
F. Service the crankcase

SE-6 Troubleshooting and Tuning a Small Engine

Objective: Given a small engine with ignition and/or fuel problems, troubleshoot and tune the engine. The engine must run according to manufacturer's specifications.

A. Cleaning small engines
B. Servicing carburetor air cleaners
C. Servicing fuel strainers
D. Servicing crankcase breathers
E. Check crankcase lubrication
F. Refueling
G. Servicing spark plugs
H. Checking, adjusting carburetor
I. Checking starter
J. Checking compression
K. Checking ignition system
L. Operate engine
M. Adjust speed and load

SE-7 Removing and Rebuilding Flow Jet Carburetor

Objective: Given a small engine with a flowjet carburetor, rebuild the carburetor. The engine must run according to manufacturer's specifications.

A. Identify type of carburetor
B. Selection of hand tools
C. Remove carburetor
D. Disassemble carburetor
E. Clean carburetor
F. Reassemble carburetor
G. Install carburetor
H. Adjust carburetor

SE-8 Removing and Rebuilding Vacu-jet Carburetor

Objective: Given a small engine with a vacu-jet carburetor, rebuild the carburetor. The engine must run according to the manufacturer's specifications.

A. Identify type of carburetor
B. Selection of hand tools
C. Remove carburetor
D. Disassemble carburetor
E. Clean carburetor
F. Reassemble carburetor
G. Install carburetor
H. Adjust carburetor

SE-9 Removing and Rebuilding Pulsa-jet Carburetor

Objective: Given a small engine with a pulsa-jet carburetor, rebuild the carburetor. The engine must run according to the manufacturer's specifications.

A. Identify type of carburetor
B. Selection of hand tools
C. Remove carburetor
D. Disassemble carburetor
E. Clean carburetor
F. Reassemble carburetor
G. Install carburetor
H. Adjust carburetor

SE-10 Removing and Repairing Recoil Starter

Objective: Given a small engine with a malfunctioning recoil starter, repair the starter. The starter must engage properly and the starter rope/cable must return to the start position.

A. Identify type of starter
B. Principles of operation
C. Tools and materials needed
D. Checking for proper operation
E. Replacing the rope
F. Repairing the drive
G. Replacing the recoil spring
H. Checking for proper operation

SE-11 Removing and Repairing Wind-up Starter

Objective: Given a small engine with a malfunctioning recoil starter, repair the starter. The starter must wind-up properly and engage the engine with enough force to start the engine.

A. Identify type of starter
B. Principles of operation
C. Spring safety precautions
D. Tools and materials needed
E. Check for proper operation
F. Remove starter assembly from engine
G. Disassemble starter
H. Clean and inspect
I. Replace worn parts
J. Reassemble starter
K. Install starter on engine
L. Recheck starter for proper operation

SE-12 Removing and Repairing Vertical Pull Starter

Objective: Given a small engine with a malfunctioning vertical pull starter, repair the starter. The starter must engage properly and the starter rope/cable must return to the start position.

A. Identify type of starter
B. Principles of operation
C. Safety precautions
D. Tools and materials needed
E. Check for proper operation
F. Remove starter assembly from engine
G. Disassemble starter
H. Clean and inspect
I. Replace worn parts
J. Reassemble starter
K. Install starter on engine
L. Recheck for proper operation

SE-13 Removing and Repairing 12-volt Starter-Generator

Objective: Given a small engine, with a malfunctioning starter-generator, repair the starter-generator. The starter-generator must operate according to the manufacturer's specifications.

A. Identify type of starter
B. Principles of operation
C. Safety precautions
D. Tools and materials needed
E. Remove starter assembly from engine
F. Disassemble starter
G. Clean and inspect
H. Replace worn parts
I. Reassemble starter
J. Install starter on engine
K. Test starter for proper operation

TASK LIST

MAJOR BLOCK: MARINE ENGINES

PERFORMANCE GROUP: OUTBOARD MARINE ENGINE REPAIR

ME-1 Six to 25 HP Magneto Ignition Systems

Objective: Describe through written exercises the operation of Magneto ignition systems in 6 to 25 HP marine engines.

A. Identification of magneto parts
B. Magneto ignition system

ME-2 Fuel Systems

Objective: Demonstrate a working knowledge of the fuel system that is used on marine engines through oral description and written examination.

A. Fuel storage
B. Fuel storage systems

ME-3 Drive Train

Objective: Describe 6 to 25 HP drive train through oral description and written examination.

A. Drive train operation
B. Drive train

ME-4 Troubleshooting

Objective: Given a marine engine with magneto ignition, troubleshoot the ignition. Malfunction(s) must be identified and corrected.

A. Coil
B. Performing coil test
C. Test coil
D. Points
E. Test and adjust points
F. Condenser
G. Testing condensers
H. Wires
I. Testing wires

ME-5 Troubleshooting

Objective: Given a 6 to 25 HP marine engine with a fuel system problem(s) troubleshoot the fuel system. The problem(s) must be identified and corrected.

A. Fuel tank
B. Testing fuel tank
C. Lines
D. Testing fuel lines
E. Filters
F. Testing fuel filters
G. Fuel pump
H. Testing fuel pump
I. Carburetor
J. Testing carburetor

ME-6 Troubleshooting

Objective: Given a 6 to 35 HP marine engine troubleshoot the drive train. The problem(s) must be identified and corrected.

A. Operation of drive train
B. Troubleshoot drive train

ME-7 Disassemble Marine Engines

Objective: Given an outboard marine engine, disassemble the power head. The power head must be disassembled according to the manufacturer's specifications.

A. Power head
B. Disassembling power head

ME-8 Disassemble Lower Unit

Objective: Given an 18 HP or larger marine engine disassemble the lower unit. The unit must be disassembled according to the manufacturer's specifications.

A. Lower unit
B. Disassembling lower unit

ME-9 Assembling Power Head and Measuring Parts

Objective: Given a disassembled power head for a marine engine, measure the parts and reassemble the power head. The amount of wear must be identified and the power head must be assembled according to the manufacturer's specifications.

A. Power unit
B. Assembling power unit
C. Micrometer
D. Measuring with micrometer

ME-10 Assemble Lower Unit

Objective: Given a disassembled lower unit for a marine engine, measure the parts and reassemble the lower unit. The amount of wear must be identified and the unit must be assembled according to the manufacturer's specifications.

A. Micrometer
B. Measuring parts
C. Lower unit
D. Assembling lower unit

ME-11 Clean, Inspect, and Repair Carburetor

Objective: Given a marine engine carburetor, clean, inspect and repair the carburetor. The carburetor must be cleaned and repaired according to the manufacturer's specifications.

A. Carburetor
B. Disassembling carburetor
C. Cleaning carburetor
D. Assembling carburetor
E. Adjusting carburetor

ME-12 Repair Fuel Pump and Filter

Objective: Given a marine engine fuel pump and filter, test and repair the pump and filter. The pump and filter must operate according to manufacturer's specifications.

A. Fuel pump
B. Testing fuel pump
C. Removing fuel pump
D. Filters
E. Cleaning filters
F. Assembling fuel pump

ME-13 Test Coil, Condenser, and Points

Objective: Given a marine engine with a magneto ignition system, test the coil, condenser, and points. All malfunctions must be identified.

A. Coil
B. Testing coil
C. Condenser
D. Testing condenser
E. Points
F. Testing points
G. Adjusting points

ME-14 Replacing Water Pump

Objective: Given a marine engine, remove, inspect and reinstall the water pump. All malfunctions msut be identified.

A. Water pump
B. Removing water pump
C. Inspecting water pump
D. Installing water pump

ME-15 Repair Fuel Tank and LInes

Objective: Given a fuel tank and line for a marine engine, inspect and repair the tank and line. All problems must be identified and repaired.

A. Fuel tank
B. Inspectinf fuel tank
C. Repairing fuel tank
D. Cleaning fuel tank

ME-16 Winterizing and Storing a Marine Engine

Objective: Given a marine engine, winterize and store the engine. The engine must be winterized and stored according to requirements for the region.

A. Removing fluids from engine
B. Removing fluid from lower unit
C. Winterizing the engine

TASK LIST

MAJOR BLOCK: AUTOMOTIVE EMISSION CONTROLS

PERFORMANCE GROUP: AUTOMOTIVE EMISSION CONTROLS

AEC-1 The Cause and Effect of Automobile Emissions

Objective: Given the proper study materials, demonstrate an understanding of the cause and effect of exhaust emissions. Must be able to correctly define the following terms in writing: (1) Hydrocarbons, (2) Carbon monoxide, (3) Oxides or nitrogen, and (4) sulfuric mist.

A. Chemistry of the internal combustion engine

AEC-2 Measuring Exhaust Emissions with an Infrared Analyzer

Objective: Given an automotive engine and an Infrared Analyzer, analyze the engine exhaust emissions. The analyzer myst be correctly connected and calibrated according to the operator's manual. The HC and CO readings must be correct at five assigned engine RPM's.

A. Connect the analyzer
B. Calibrate the analyzer
C. Analyze the exhaust for HC and CO levels

AEC-3 Testing the Relationship of Ignition Timing and Carburetion on HC and CO Emissions

Objective: Given an automotive engine, and the necessary tools and equipment demonstrate the effects of improper ignition timing and improper carburetor adjustments on engine exhaust. Must be able to determine which carburetor and timing settings produce the least amount of HC and CO.

AEC-4 Testing Positive Crankcase Ventilation System

Objective: Given two automotive engines equipped with positive crankcase control (PVC) systems, test the PVC systems and analyze the test results. The PVC systems must be tested according to the

AEC-4 cont'd

manufacturer's recommended procedures. The test results must be correctly analyzed.

A. Perform an rpm Drop Test
B. Perform a vacuum test
C. Perform an instrument test on PVC system
D. Analyze the results

AEC-5 Testing Thermostatic Air Cleaner Operation

Objective: Given an automotive engine equipped with a thermostatic air cleaner, and the necessary tools and equipment, test the operation of the thermostatic air cleaner operation. The thermostatic air cleaner must be tested according to the manufacturer's recommended procedures. Must be able to explain the operation of a thermostatic air cleaner.

A. Attach vacuum gauge
B. Attach tachometer
C. Attach exhaust analyzer
D. Perform an operational test on the thermostatic air cleaner
E. Explain the operation of the thermostatic air cleaner

AEC-6 Testing the Air Injection Reaction (AIR) System

Objective: Given an automotive engine equipped with an Air Injection Reaction System (AIR) and the necessary test equipment, perform an AIR operational test and analyze the test results. The test must be performed according to the manufacturer's recommended procedures. The test results must be correctly analyzed.

A. Attach test equipment
B. Perform an AIR test
C. Analyze the results

AEC-7 Testing the Fuel Evaporative Control System.

Objective: Given an automotive vehicle equipped with a fuel evaporative control system, perform a visual and

AEC-7 cont'd

purge test. The tests must be performed according to the manufacturer's recommended procedures. Must be able to accurately describe the operation of the Fuel Evaporative Control System.

A. Perform a visual inspection of the Fuel Evaporative Control System
B. Connect emission tester
C. Connect tachometer
D. Perform a purge test of the Fuel Evaporative Control System.
E. Describe the operation of the system

AEC-8 Testing the Exhaust Gas Recirculation System

Objective: Given an automatic engine equipped with a complete Exhaust Gas Recirculation (EGR) System, test the system and analyze the test results. The test must be performed according to the manufacturer's recommended procedure. The test results must be correctly analyzed.

A. Connect vacuum gauge
B. Connect tachometer
C. Test the EGR-CTO switch
D. Perform EGR system test
E. Analyze the test results

AEC-9 Performance Testing the Spark Control System

Objective: Given an automotive vehicle, perform a spark control test. The test must be performed according to the manufacturer's recommended procedure. Must be able to identify and state the purpose of each part.

A. Connect emissions analyzer
B. Connect tachometer
C. Connect vacuum gauge
D. Perform spark control system test
E. Identify and state the purpose of each part

AEC-10 Testing the Catalytic Converter System

Objective: Given two different makes of automotive vehicles with one having an analyzer probe access forward of the converter, perform an operational test of the catalytic converters and analyze the test results. The tests must be performed according to the manufacturer's recommended procedures and test results must be analyzed correctly.

A. Connect emissions tester
B. Connect tachometer
C. Connect timing light
D. Perform operational tests on the catalytic converters
E. Analyze the test results

POST-SECONDARY Major Blocks - Tasks	SECONDARY Packages - Units	Service station mechanic 620-261-10	Auto mechanic 620-261-10	Brake mechanic 620-281-026	Carburetor mechanic 620-281-034	Front end mechanic 620-281-038	Transmission mechanic 620-281-062	Auto mechanic helper 620-684-014	Tune-up mechanic 620-281-066
Shop Theory (102)	Handtools (HT)								
	HT-1 Introduction to Handtools	X	X	X	X	X	X	X	X
	HT-2 Demonstrating Basic Handtool Use								
102-1 Making a Thread Gauge Block	HT-3 Making a Thread Gauge Block								
102-2 Install Helicoil	HT-4 Removing Broken Stud and Installing Helicoil								
	HT-5 Cutting and Double Flaring Copper Tubing								
	HT-6 Shop Safety	X	X	X	X	X	X	X	X
102-3 Measuring Cylinder Diameters and Crank Pins		X	X						
Basic Electricity (201)	Testing and Servicing a Battery (TSB)								
201-1 Testing Electrical Wiring Condition			X						X
201-2 Replacing Wire Ends and Splicing Conductors			X					X	X
201-3 Testing Semi-Conductors			X						X
201-4 Testing and Servicing Storage Battery	TSB-1 Testing Battery Gravity TSB-2 Performing Light Load Test on the Battery TSB-3 Testing Battery Capacity TSB-4 Cleaning the Battery TSB-5 Charging the Battery	X	X					X	X
201-5 Fundamentals of Magnetism									
Automotive Engines (211)	Valve Grinding and Adjustment (VGA)								
211-1 Disassembling Engine (V/8 or 6 cylinder)			X						
211-2 Assembling Engine (V/8 or 6 cylinder)			X						
211-3 Removing Engine		X	X						
211-4 Cleaning Engine and Engine Compartment		X	X						
211-5 Removing, Disassembling, Cleaning Cylinder Head	VGA-1 Removing, Disassembling, and Cleaning Cylinder Head		X						
211-6 Grinding Valves and Chamfering Stems	VGA-2 Inspecting and Adjusting Valve Grinding Machinery VGA-3 Dressing a Grinding Stone VGA-4 Grinding Valves VGA-5 Squaring Off Valve Stems		X						
211-7 Reconditioning Valve Guides and Grinding Valve Seats	VGA-6 Reconditioning Valve Guides VGA-7 Grinding and Sizing Valve Seats		X						
211-8 Assembling Cylinder Head and Valves	VGA-8 Assembling Valves		X						
211-9 Removing and Servicing Pistons and Rods			X						
211-10 Removing and Measuring Crankshaft and Camshaft			X						
211-11 Servicing Cylinder Block			X						
211-12 Installing Crankshaft and Rear Oil Seal			X						
211-13 Installing Crankshaft and Timing Gears			X						
211-14 Installing Pistons and Rod Assemblies									
211-15 Install Cylinder Heads	VGA-9 Installing Cylinder Heads		X						
211-16 Cleaning and Testing Valve Lifters	VGA-10 Removing and Cleaning Valve Lifters		X						
	VGA-11 Reassembling Valve Lifters		X						
211-17 Reconditioning and Installing Rocker Arms and Adjusting Valves	VGA-12 Installing Rocker Arms and Adjusting Valves		X						
211-18 Installing Oil Pump Pan, Manifold, Housing Covers and Accessories			X						
211-19 Installing Engine		X	X						
211-20 Troubleshooting and Diagnosing Engine Problems			X						

		Service station mechanic 620-261-10	Auto mechanic 620-261-10	Brake mechanic 620-281-026	Carburetor mechanic 620-281-034	Front end mechanic 620-281-038	Transmission mechanic 620-281-062	Auto mechanic helper 620-684-014	Tun.-up mechanic [illegible]
Cooling and Lubrication (212)									
	Servicing Cooling Systems (SCS)								
212-1 Servicing Cooling System	SCS-1 Check Anti-Freeze and Pressure Test Cooling System								
	SCS-2 Flush and Winterize Cooling System								
	SCS-3 Replace Radiator and Heater Hose	X	X					X	
	SCS-4 Remove and Replace Radiator	X	X						
	SCS-5 Replace Thermostat and Bypass Line								
	SCS-6 Replace and Adjust Drive Belts	X	X					X	
	SCS-7 Replace Water Pump and Check Fan Clutch	X	X					X	
	SCS-8 Check Temperature Gauge, Remove and Replace Block Unit	X	X						
	Chassis Lubrication (CL)								
	CL-1 Using the Twin Post Hoist								
212-2 Servicing Engine Lubricating System	CL-2 Change Oil and Oil Filter								
212-3 Lubricating Chassis	CL-3 Lubricate Chassis								
	CL-4 Lubricate Body Friction Points	X	X					X	
	CL-5 Change Automatic Transmission Fluid	X	X				X	X	
212-4 Replacing and/or Repacking Wheel Bearings	CL-6 To Pack Front Wheel Bearings (With Drum Type Brakes)	X	X	X				X	
	CL-7 Pack Front Wheel Bearings (With Disc Brakes)								
Basic Fuel Systems (213)	**Fuel Systems (FS)**								
213-1 Cleaning or Repairing Fuel Tanks and Lines	FS-1 Cleaning and Repairing Fuel System Components		X		X				
213-2 Testing and/or Replacing Fuel Pump	FS-2 Testing and Replacing the Fuel Pump	X	X		X			X	
213-3 Overhaul a Single Barrel Rochester Carburetor	FS-3 Overhauling a Single Barrel Carburetor	X			X				
213-4 Overhauling a Single Barrel Ford Carburetor	FS-4 Adjusting an Overhauled Carburetor								
213-5 Overhauling a Two-Barrel Rochester Carburetor 213-6 Overhauling Chrysler Product Two-Barrel Carburetor 213-7 Overhauling Two-Barrel Ford Carburetor	FS-5 Overhauling a Two-Barrel Carburetor								
213-8 Troubleshooting Fuel System Problems			X		X				
213-9 Servicing Exhaust System	FS-6 Repairing the Exhaust System	X	X						
213-10 Servicing Carburetor Air Cleaner		X	X	X	X	X	X		
Charging Systems (221)	**Testing Charging System (TCS)**								
221-1 Testing a D-C Charging System	TCS-1 Polarizing and Troubleshooting a D-C Generator	X	X						X
221-2 Overhauling a D-C Generator			X						X
	TCS-2 Replacing and Adjusting Drive Belts	X	X						
221-3 Turning Armature and Undercutting Mica			X						
221-4 Benchtesting an D-C Generator			X						X
221-5 Testing, Setting and/or Replacing a D-C Regulator		X	X					X	X
221-6 Testing an A-C Charging System (Conventional Type)	TCS-3 Inspecting and Testing an Alternator System								
	TCS-4 Performing Current Output and Circuit Resistant Test	X	X						
221-7 Overhauling an A-C Charging System (Conventional Type) GM	TCS-5 Removing and Disassembling the Alternator								
	TCS-6 Bench Testing the Alternator								
	TCS-7 Disassembling the Alternator								
221-8 Overhauling a Ford Motor Type A-C Generator (Conventional Type)	TCS-8 Performing Rotor Tests and Stator Tests on an Alternator		X						X
221-9 Overhauling A-C Generator	TCS-9 Testing Diodes								
	TCS-10 Assembling and Installing an Alternator								
221-10 Adjusting an A- Regulator (Conventional Type)	TCS-11 Testing an A-C Regulator		X						X
	TCS-12 Adjusting an A-C Regulator		X					X	X
	TCS-13 Replacing an A-C Regulator		X					X	X
221-11 Testing Indicator Lamp and Ammeter									

		Service station mechanic 620-261-10	Auto mechanic 620-261-10	Brake mechanic 620-281-026	Carburetor mechanic 620-281-034	Front end mechanic 620-281-038	Transmission mechanic 620-281-062	Auto mechanic helper 620-684-014	Tune-up mechanic 620-281-066
Cranking Systems (222)									
222-1 Troubleshooting Cranking System	Testing Starter Motor (TSM)								
	TSM-1 Testing Starter Motor Resistance and Amperage Draw	X	X						X
	TSM-2 Removing and No Load Testing a Starter Motor								
	TSM-3 Performing an Armature and Field Open and Grounded Circuit Test								
	TSM-4 Testing Components, Assembling and Installing a Starter								
222-2 To Overhaul Cranking Motor (Delco-Remy)			X						X
222-3 Overhauling Cranking Motor (Ford Type)									
222-4 Overhauling Gear Reduction Cranking Motor (Chrysler)		X	X						X
222-5 Servicing Cranking System Controls									
Basic Engine Tune-Up (223)	Testing Engine (STE)	X	X						
	STE-1 Calibrate the Sun Ten-Twenty Tester	X	X						
	STE-2 Making Corrections for Different Attachments on the Sun Ten-Twenty Tester	X	X						X
	STE-3 Performing Engine Tests	X	X						
	STE-4 Identifying Scope Patterns	X	X						
	STE-5 Testing Firing Patterns	X	X						
	STE-6 Using Sun Ten-Twenty Tester to Run Power Balance Test on Cylinders		X						
223-1 Testing Engine Internal Condition	STE-9 Testing Engine Internal Condition	X	X						X
223-2 Testing Cranking System		X	X						X
223-3 Testing Charging System		X	X						X
223-4 Testing Ignition System									
223-5 Overhauling a Conventional Delco Remy Distributor	Testing Ignition Distributor (TID)								
223-6 Overhauling a Chrysler Ignition Distributor	TID-1 Removing a Distributor	X	X						X
223-7 Overhauling a Ford Ignition System	TID-2 Testing a Distributor								
223-8 Replacing Distributor Cap and Spark Plug Wires	TID-3 Installing Points in a Distributor								
	TID-4 Installing a Distributor								
	TID-5 Setting the Timing								
223-9 Cleaning or Replacing Spark Plugs	Spark Plug Service (SPS)								
	SPS-1 Removing Spark Plugs	X	X						X
	SPS-2 Cleaning Spark Plugs								
	SPS-3 Gapping Spark Plugs								
	SPS-4 Testing Spark Plugs								
	SPS-5 Testing Spark Plugs for Correct Polarity								
223-10 Testing Ignition Coil	Testing Ignition Coil and Condenser (TIC)		X						
	TIC-1 Testing Ignition Coil								
	TIC-2 Testing the Condenser	X	X						
223-11 Testing Fuel Pump			X						
223-12 Performing On-Car Fuel System Tests and Adjustments									
223-13 Performing Tests and Servicing Emission Controls	Testing Engines (STE) (Continued)	X	X						
223-14 Testing Exhaust System	STE-7 Analyzing Exhaust with the Sun Ten-Twenty Tester								
	STE-8 Performance Testing Engine Operation and Exhaust Emission								

Hydraulic Brakes (231)	Hydraulic Brakes (HB)	Service station mechanic 620-261-10	Auto mechanic 620-261-10	Brake mechanic 620-281-026	Carburetor mechanic 620-281-034	Front end mechanic 620-281-038	Transmission mechanic 620-281-062	Auto mechanic helper 620-684-014	Tune-up mechanic 620-281-066
231-1 Checking Brake System Condition and Operation	HB-1 Checking Brake System Condition and Operation	X	X	X		X			
231-2 Overhauling Master Cylinder	HB-2 Overhauling a Master Cylinder			X					
	Chassis Lubrication (CL) (Continued)								
231-3 Cleaning, Packing, and/or Replacing Front Wheel Bearings	CL-6 To Pack Front Wheel Bearings (With Drum Type Brakes) CL-7 Pack Front Wheel Bearings (With Disc Brakes)	X	X	X				X	
	Hydraulic Brakes (HB) (Continued)								
231-4 Overhauling and/or Replacing Wheel Cylinders	HB-3 Overhauling and/or Replacing Wheel Cylinder		X	X				X	
231-5 Turning Brake Drum	HB-4 Turning Brake Drums		X	X				X	
231-6 Cam Grinding Brake Shoe	HB-5 Cam Grinding Brake Shoes		X	X				X	
231-7 Replacing Brake Shoes	HB-6 Replacing Brake Shoes	X	X	X		X			
231-8 Replacing Brake Pipe		X	X	X		X			
231-9 Bleeding Brake System	HB-7 Bleeding Brake System	X	X	X				X	
231-10 Grinding Brake Drums	HB-8 Grinding Brake Drums		X	X					
231-11 Making a Complete Brake System Overhaul	HB-10 Overhauling Brake System		X	X				X	
231-12 Replacing Front Disc Pads	HB-9 Replacing Front Disc Pads	X	X	X				X	
231-13 Replace Power Brake Unit	HB-11 Machine a Disc Brake Rotor		X	X					
Suspension and Alignment (232)	Servicing Suspension System (SSS)								
232-1 Inspecting Steering Linkage and Suspension	SSS-1 Inspect and Rotate Tires		X			X		X	
232-2 Setting Caster	SSS-7 Inspect Front Suspension	X	X	X		X			
232-3 Setting Camber			X			X			
232-4 Checking Steering Axis Inclination and Turning Radius			X			X			
232-5 Setting Toe-In and Straight Ahead			X			X			
232-6 Inspecting and Aligning Front End	SSS-8 Align Front Suspension		X			X			
232-7 Balancing Front Wheels 232-8 Balancing Rear Wheels	SSS-2 Static or Bubble Balance Wheels SSS-6 Speed Balance a Wheel on the Car	X	X X	X		X X		X	
	Chassis Lubrication (CL) (Continued)								
232-9 Cleaning and Packing Front Wheel Bearings	CL-6 To Pack Front Wheel Bearings (With Drum Type Brakes) CL-7 Pack Front Wheel Bearings (With Disc Brakes)	X	X	X				X	
232-10 Truing Tires			X			X		X	
232-11 Replacing and Adjusting Torsion Bars, Replacing Shocks		X	X			X		X	
232-12 Replacing Coil Springs Lower (Control Arm Mounted)			X			X			
232-13 Replacing Coil Springs Upper (Control Arm Mounted)			X			X			
232-14 Replacing Steering Linkage		X	X			X			
232-15 Replacing Ball Joints and Control Arm Bushings			X			X		X	
	Servicing Suspension System (SSS) (Continued)								
	SSS-3 Dismount and Remount a Tire	X							
	SSS-4 Repair an Inner Tube	X							
	SSS-5 Repair a Tubeless Tire	X							

		Service station mechanic 620-261-10	Auto mechanic 620-261-10	Brake mechanic 620-281-026	Carburetor mechanic 620-281-034	Front end mechanic 620-281-038	Transmission mechanic 620-281-062	Auto mechanic helper 620-684-014	Tune-up mechanic 620-281-066
Conventional Steering Gears (233)									
233-1	Adjusting Steering Gear								
233-2	Overhauling Steering Gear								
233-3	Removing and Replacing Steering Gear								
233-4	Reconditioning Energy Absorbing Steering Column								
Power Transmission (241)									
241-1	Servicing U-Joints and Drive Shafts								
241-2	Overhauling a 3-Speed Transmission								
241-3	Replacing Clutch								
241-4	Overhauling Syncromesh 4-Speed Transmission								
241-5	Overhauling Removal Carrier Type Differential								
241-6	Overhauling Integral Carrier Type Rear Axle								
241-7	Replacing and Adjusting Tapered-Type Rear Axle Bearing								
Basic Automatic Transmission (242)									
242-1	Troubleshooting Automatic Transmissions								
242-2	Adjusting Linkage and Replacing or Adjusting Modulator								
242-3	Change Transmission Pump Screen								
242-4	Replacing Front Pump Seal								
Accessories (243)									
243-1	Repairing or Replacing Horn and Horn Ring								
243-2	Repairing or Replacing Windshield Wiper Motor or Control								
243-3	Testing and Replacing Power Window, Seat Motor, or Controls								
243-4	Troubleshooting Lighting Systems and Setting Head Lamps								
243-5	Testing and/or Replacing Heater Motor								
243-6	Replacing Heater Controls								
243-7	Testing and Repairing or Replacing Instruments and Gauges								
243-8	Performance Testing Air Conditioning System								
243-9	Discharging Air Conditioner								
243-10	Evacuating and Charging Air Condtioning System								
243-11	Replacing Compressor Seal and Checking Compressor Oil								
243-12	Replacing Refrigerant Hose, Dryer or Filters								

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Federal law prohibits discrimination on the basis of race, color or national origin (Title VI of the Civil Rights Act of 1964); sex (Title IX of the Educational Amendments of 1972 and Title II of the Vocational Education Amendments of 1976); or handicap (Section 504 of the Rehabilitation Act of 1973) in educational programs or activities receiving federal financial assistance.

Employees, students and the general public are hereby notified that the Georgia Department of Education does not discriminate in any educational programs or activities or in employment policies.

The following individuals have been designated as the employees responsible for coordinating the department's effort to implement this nondiscriminatory policy.

Title II - Loydia Webber, Vocational Equity Coordinator
Title VI - Peyton Williams Jr., Associate Superintendent of State Schools and Special Services
Title IX - Evelyn Rowe and Myra Tolbert, Coordinators
Section 504 - Jane Lee, Coordinator of Special Education

Inquiries concerning the application of Title II, Title VI, Title IX or Section 504 to the policies and practices of the department may be addressed to the persons listed above at the Georgia Department of Education, State Office Building, Atlanta 30334; to the Regional Office for Civil Rights, Atlanta 30323; or to the Director, Office for Civil Rights, Education Department, Washington, D.C. 20201.